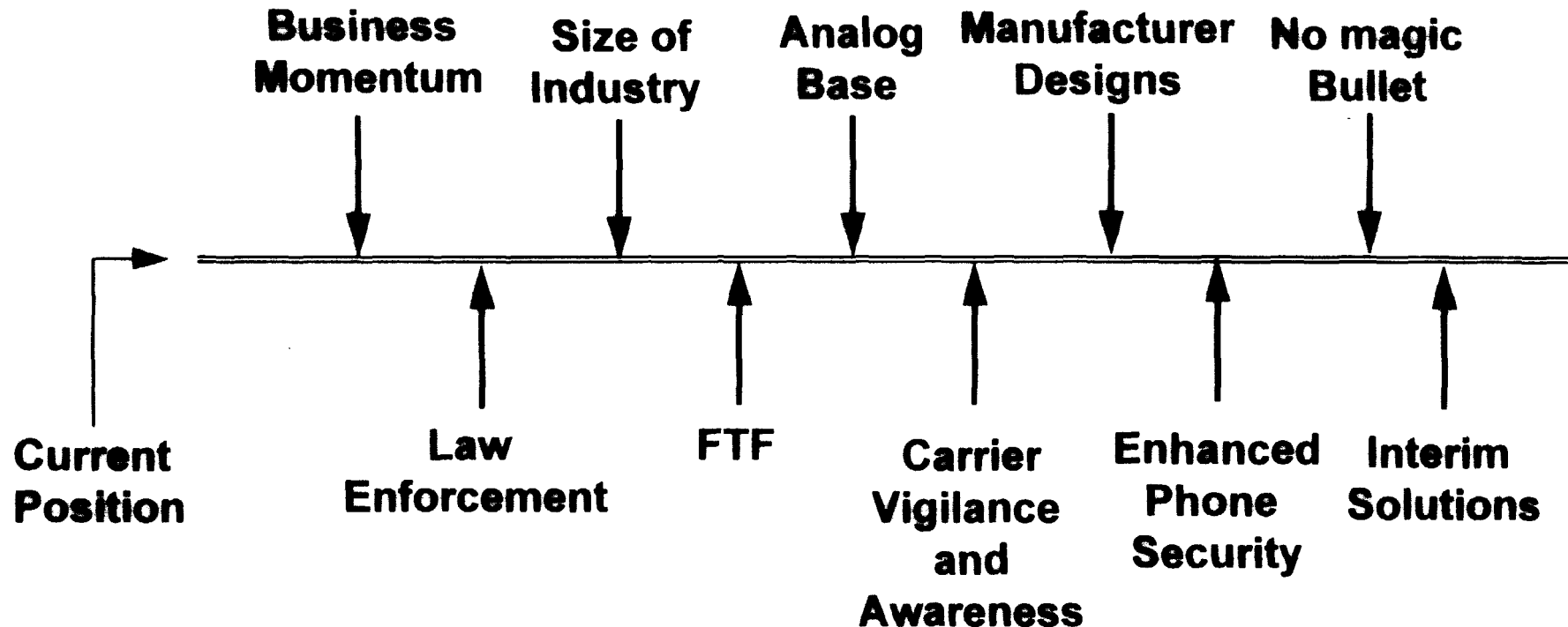
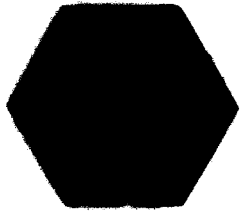


Opposing Forces in the Fraud Game

Fraud contained throughout N. America



Fraud out-of-control in N. America



The State of Affairs – the Problem of Fraud Control

PROBLEM

Current Environment (Fragmented)

We're using....

...Profiler

...nothing

...PINs

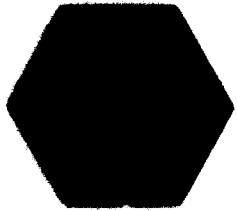
...PINs &
RF Prints

Tomorrow's Environment (Ubiquitous)

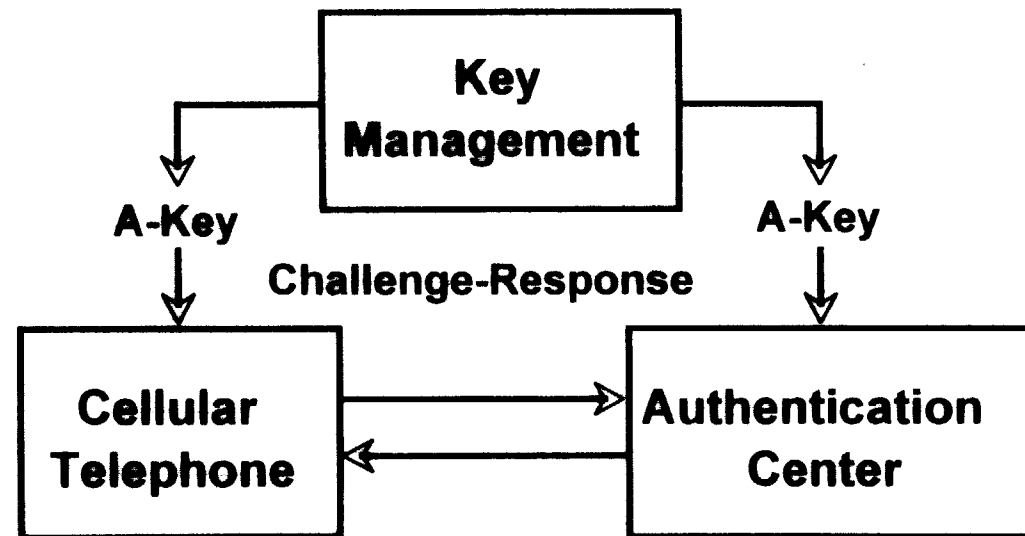
We're using...

...AUTHENTICATION

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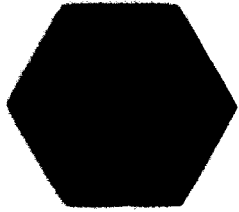


Key Management for Cellular – A Challenge

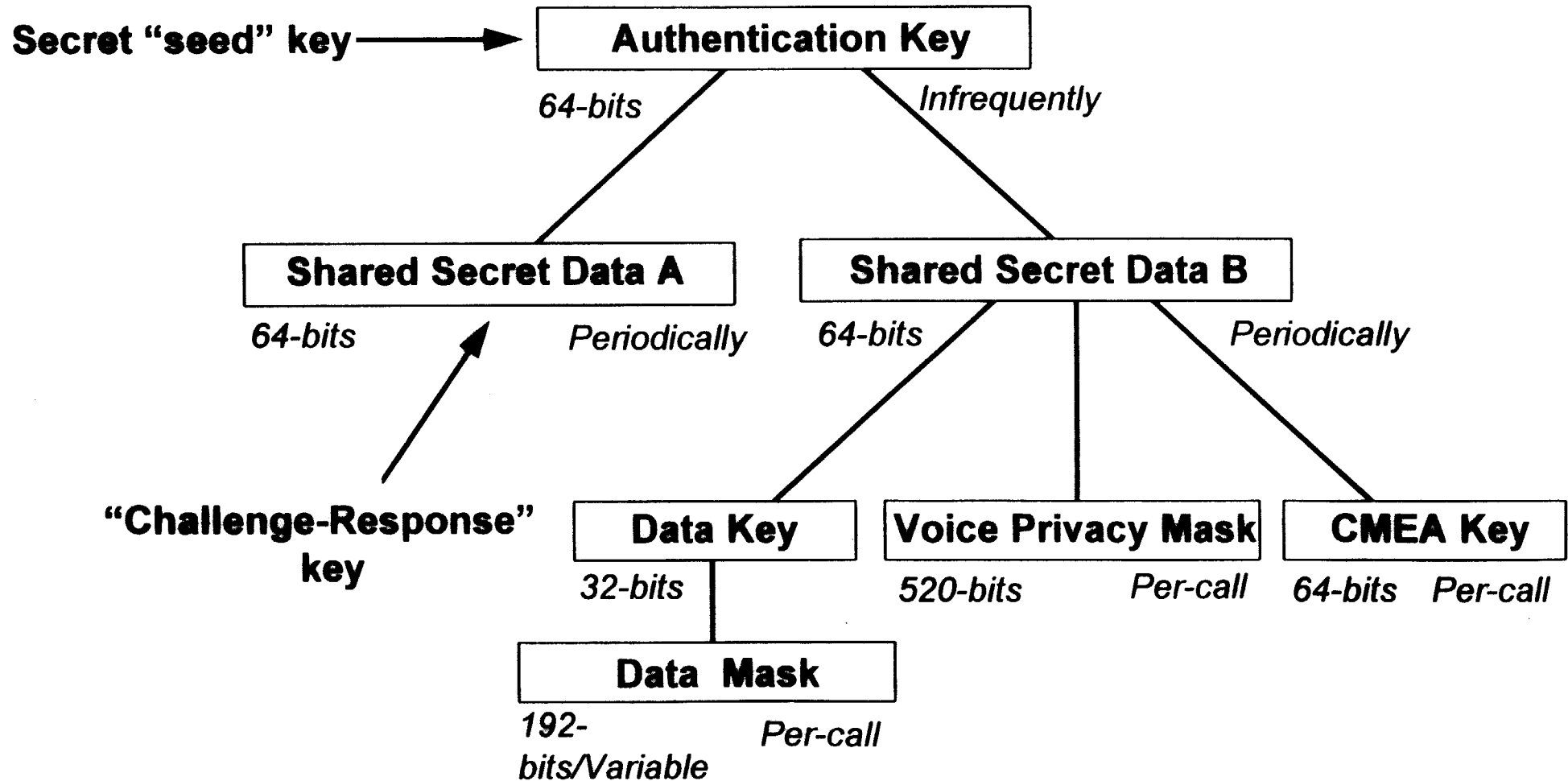


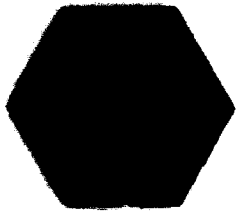
700-82

“The generation, distribution/issuance, storage, updating, destruction, and archiving of authentication keys (A-keys)”

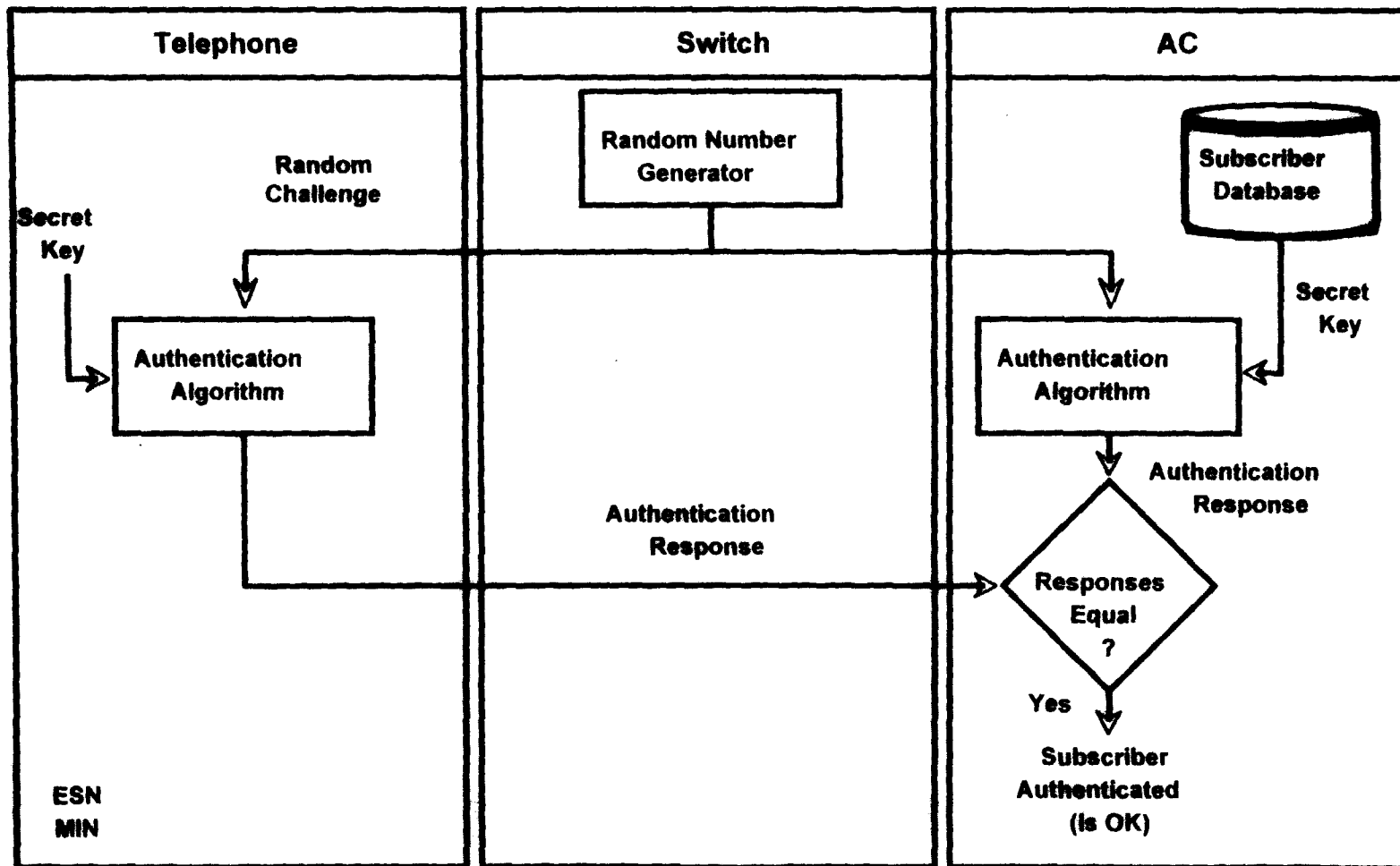


Cellular Cryptographic Key Hierarchy – Security Enabler

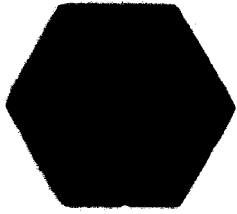




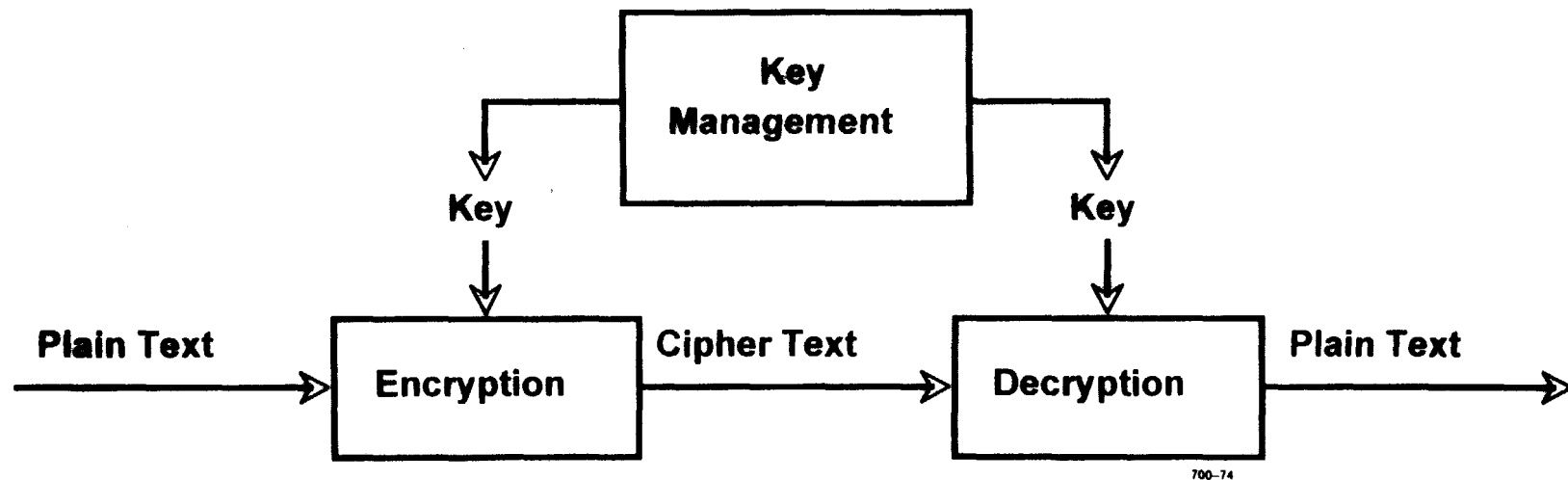
Principle of Cellular Authentication



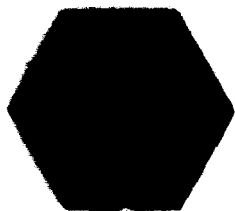
700-63



Cryptographic Key Management



“The generation, distribution/issuance, storage, updating, destruction, and archiving of keys”

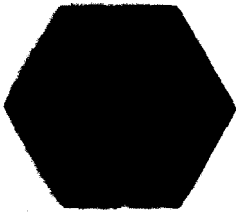


What Are the Odds?

◆ You will ...

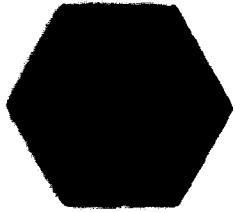
... be killed in an air crash	1 in 4,600,000
... win in a state lottery	1 in 4,000,000
... die in a fire this year	1 in 40,000
... develop a brain tumor	1 in 25,000
... die in a car crash	1 in 125
... undergo an audit this year	1 in 100
... become a victim of fraud	1 in ?

Source: "What the odds are" by Les Krantz



Fraud and Misuse: A Perspective

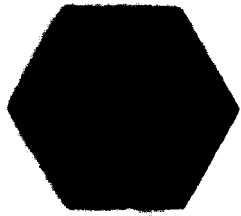
- ◆ **Cable industry losses exceeded \$4.7 billion in 1992**
- ◆ **Toll fraud is estimated at \$4 billion annually**
- ◆ **Credit-card losses approached \$1 billion in 1993**
- ◆ **Losses from IRS filing fraud range from \$1 billion to \$5 billion annually**
- ◆ **Cellular fraud “hard dollar” losses exceeded \$700 million in 1995**



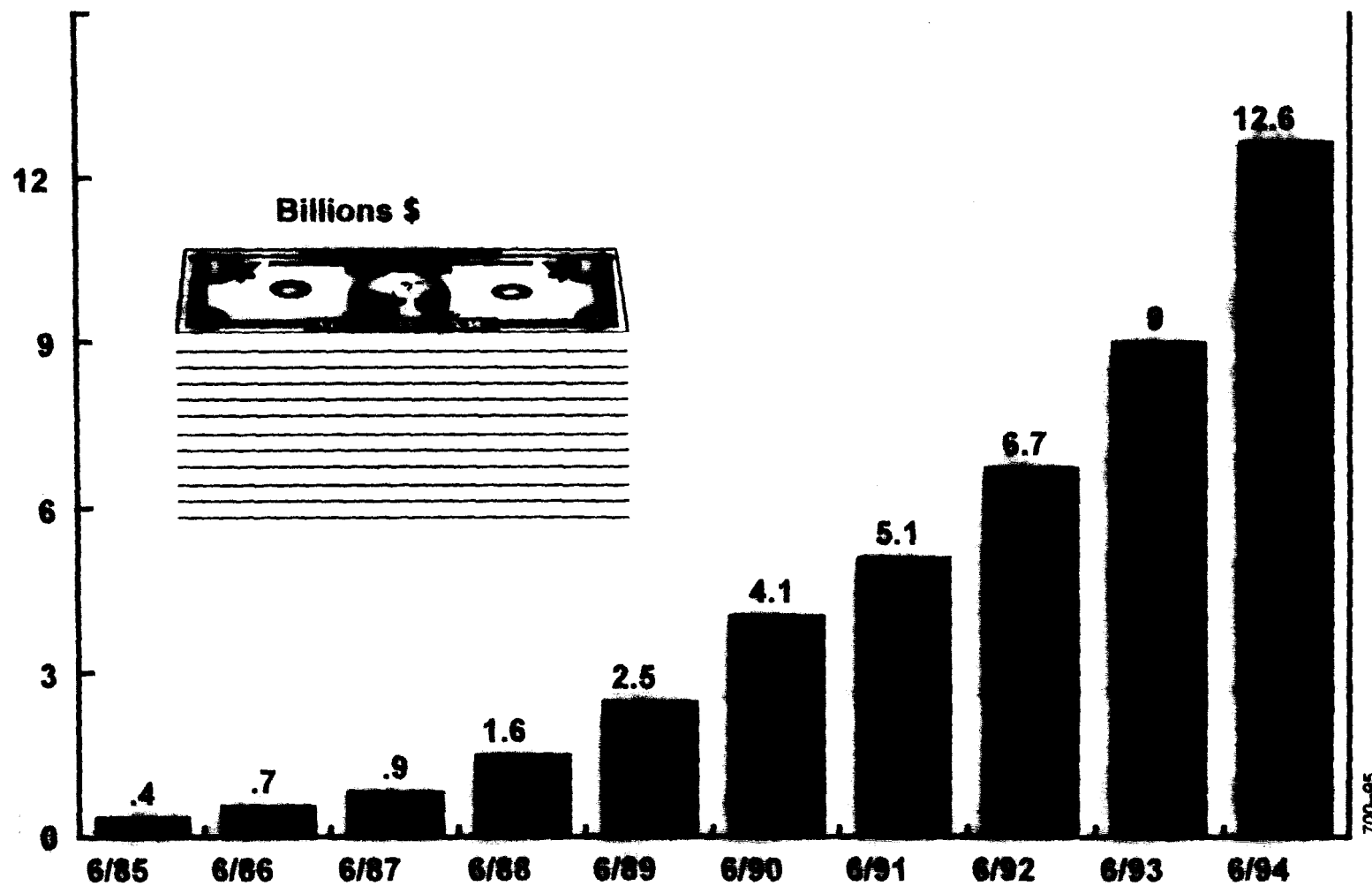
What are the Telecom Fraud losses?

1995 Estimates are ...

◆ ...CPE toll fraud	\$1.3 Billion
◆ ...Subscription fraud	\$450 Million
◆ ...Calling card fraud	\$450 Million
◆ ...Cellular fraud	\$400 Million
◆ ...800 calls by hackers	\$235 Million
◆ ...Hits to switches/networks	\$190 Million
◆ ...Prisoner toll fraud	\$100 Million
◆ ...800/900 fraud	\$100 Million
◆ ...Pay phone fraud	\$90 Million

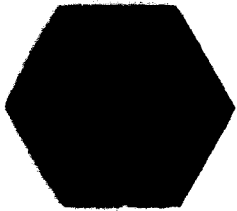


Twelve-Month Revenues June 1985 – June 1994



Source: CTIA Mid-Year Data Survey, June 1994

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Cryptology — Basic Concepts

◆ Cryptology

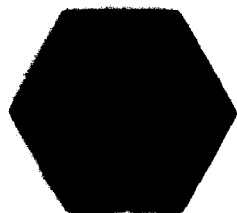
- **Science that embraces both cryptography and cryptanalysis**

◆ Cryptography

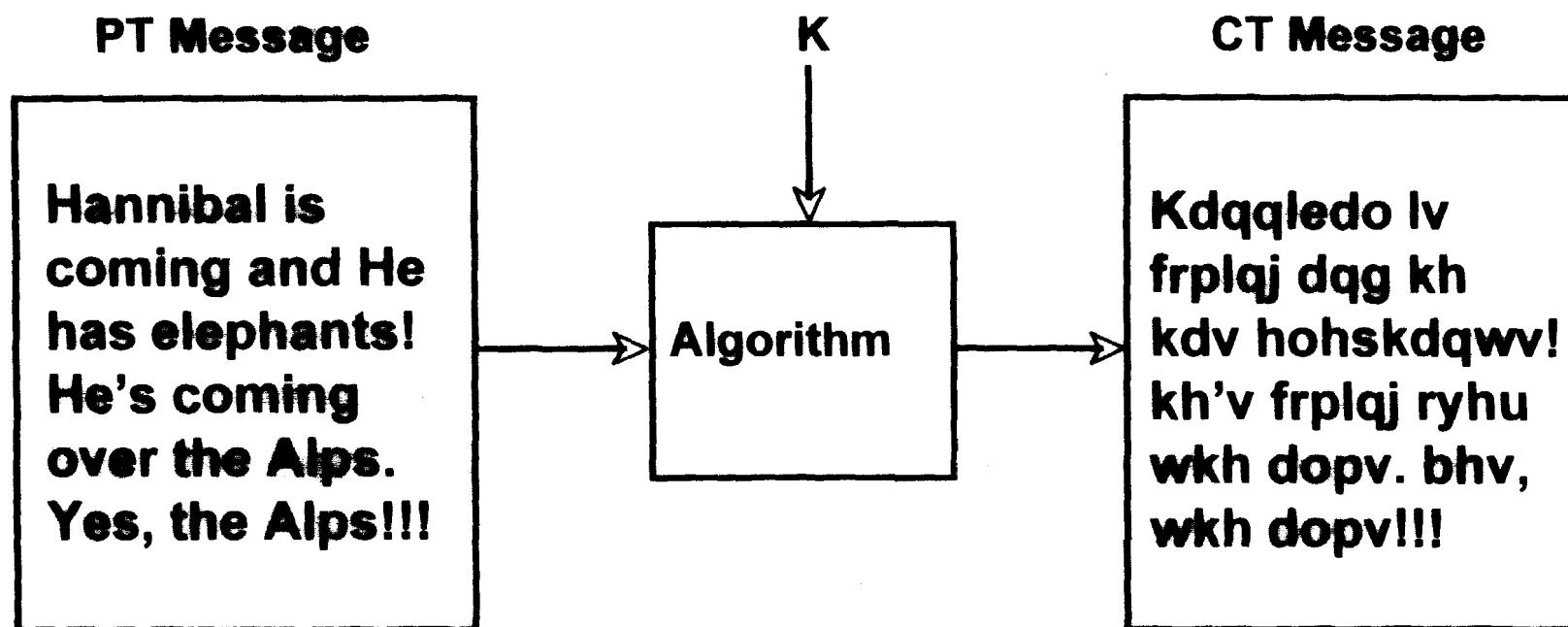
- **Art (or science) of secret writing**
- **Includes means for performing all “security services”**

◆ Cryptanalysis

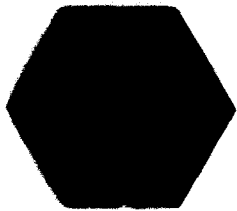
- **Attempt to descramble or scramble without knowledge of secret key**



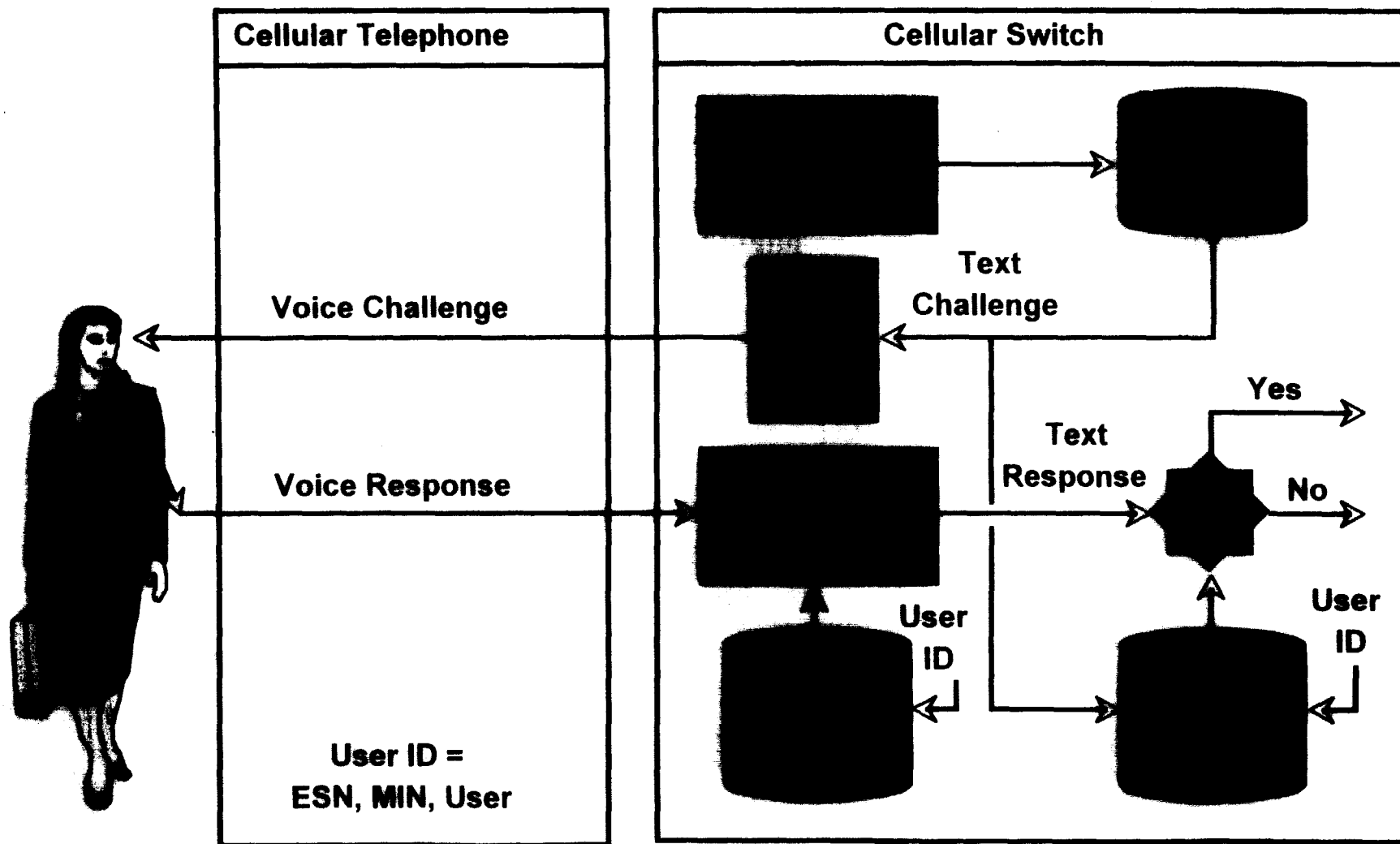
Example of Simple Cryptographic System

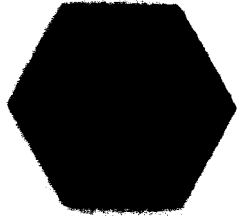


700-90

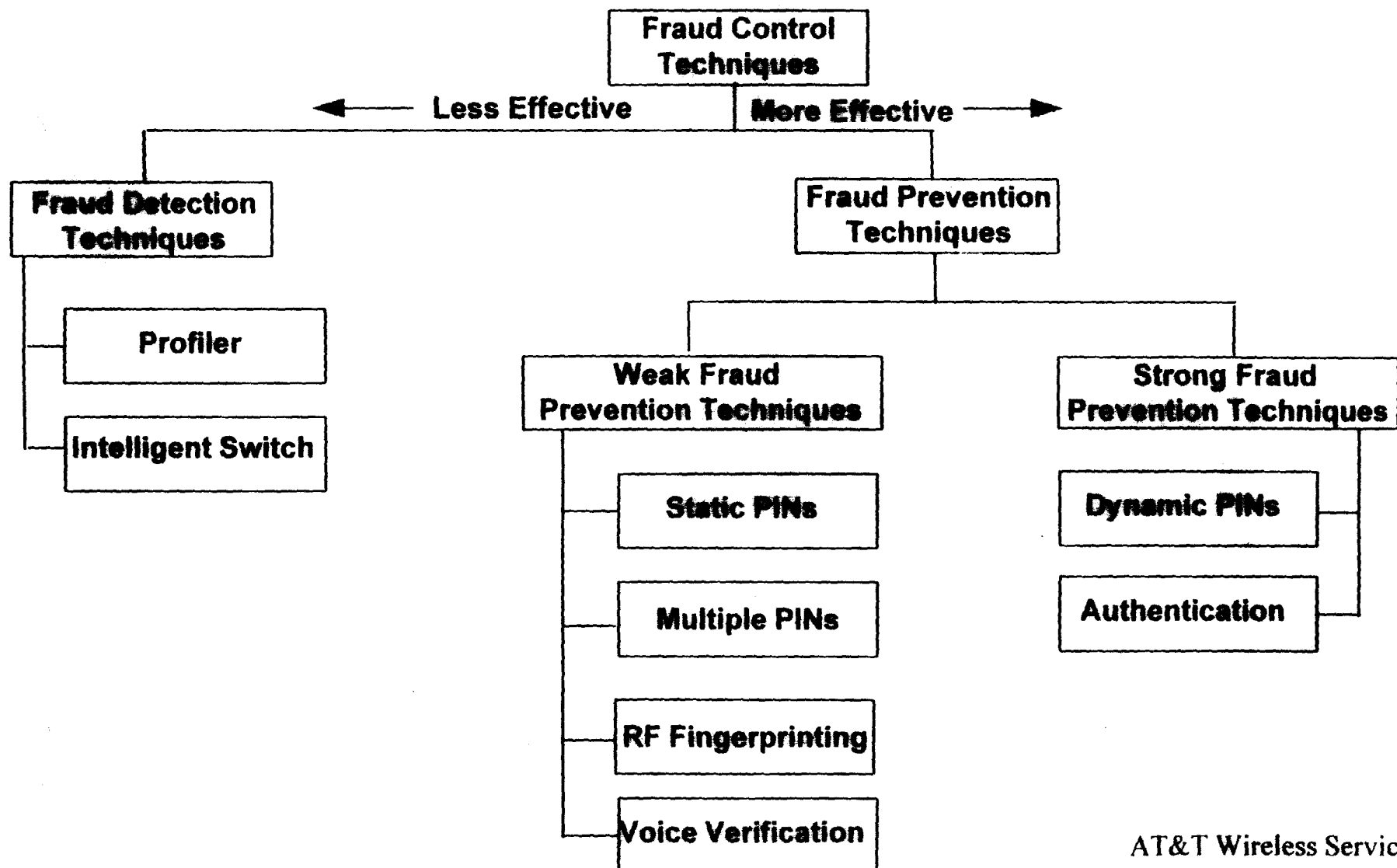


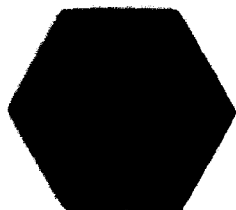
Principle of Cellular Authentication Using Voice Verification





Taxonomy of Fraud Control Techniques

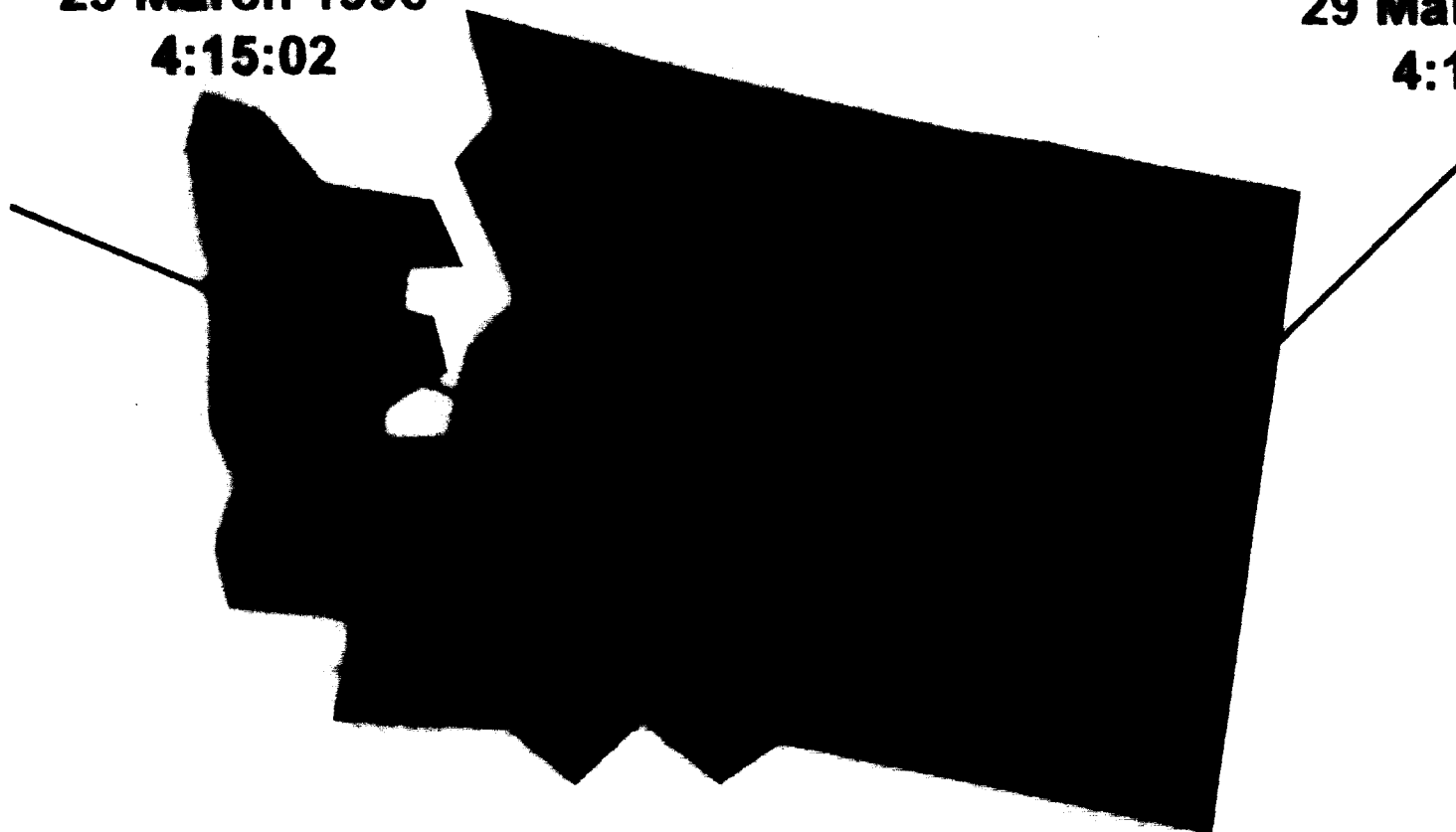


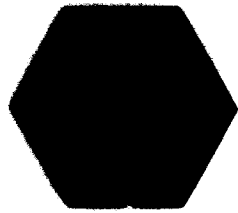


Velocity Checking – An Example

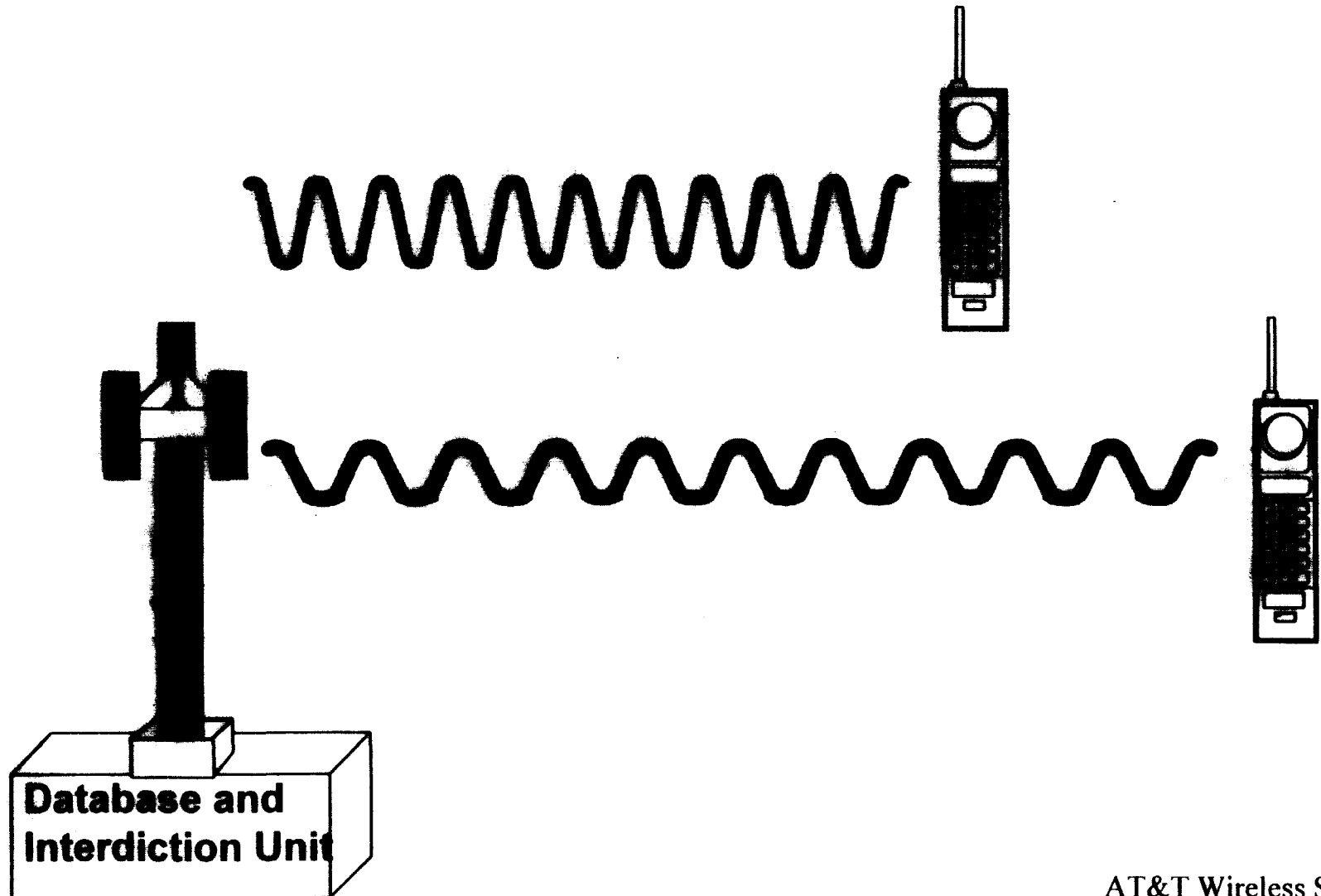
Seattle
29 March 1996
4:15:02

Spokane
29 March 1996
4:16:54

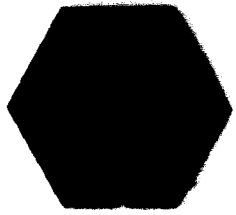




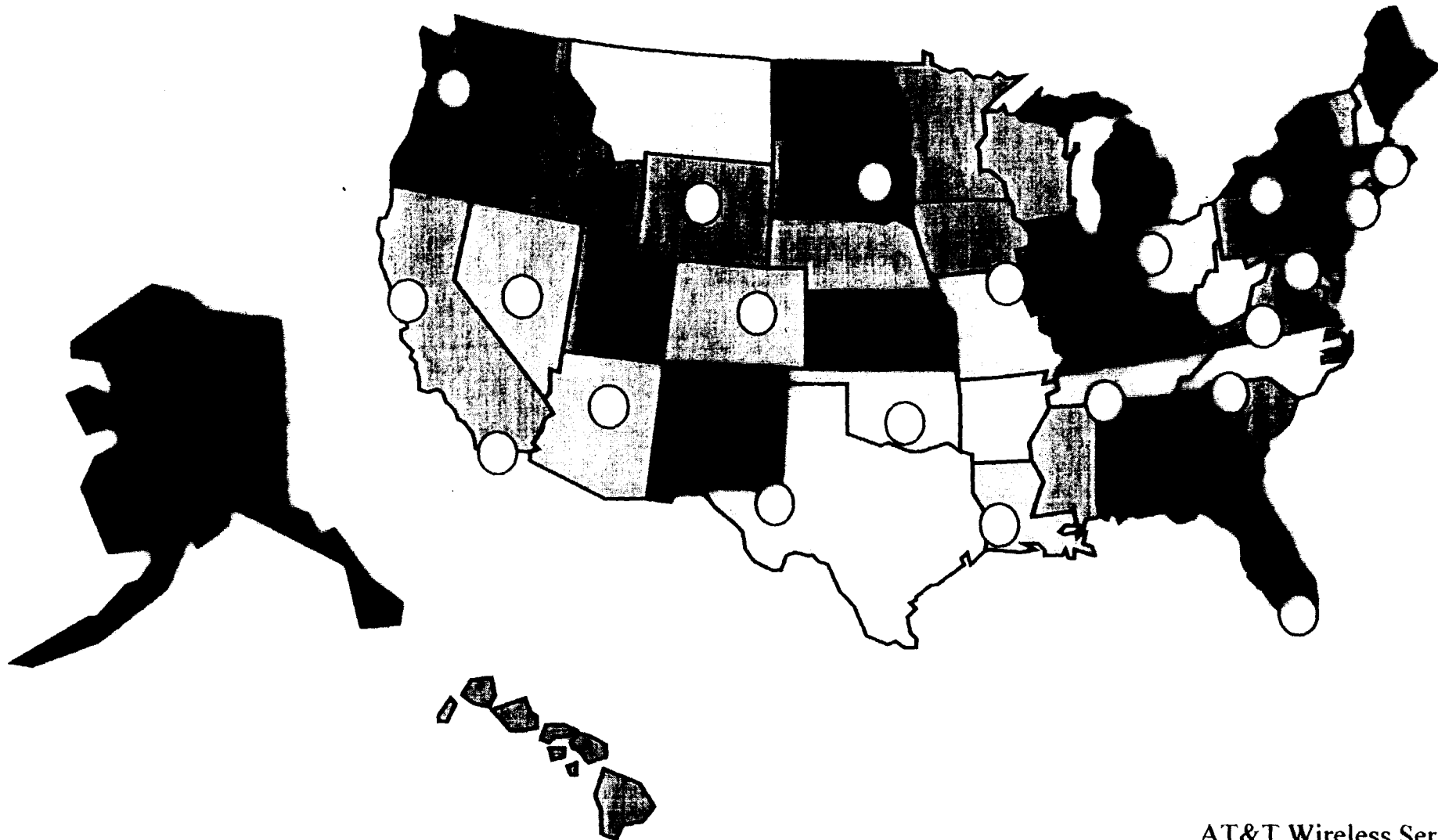
RF Fingerprinting Technology - Per cell site



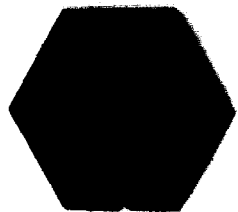
Cellular Fraud: History, Status, Technology, and Prevention



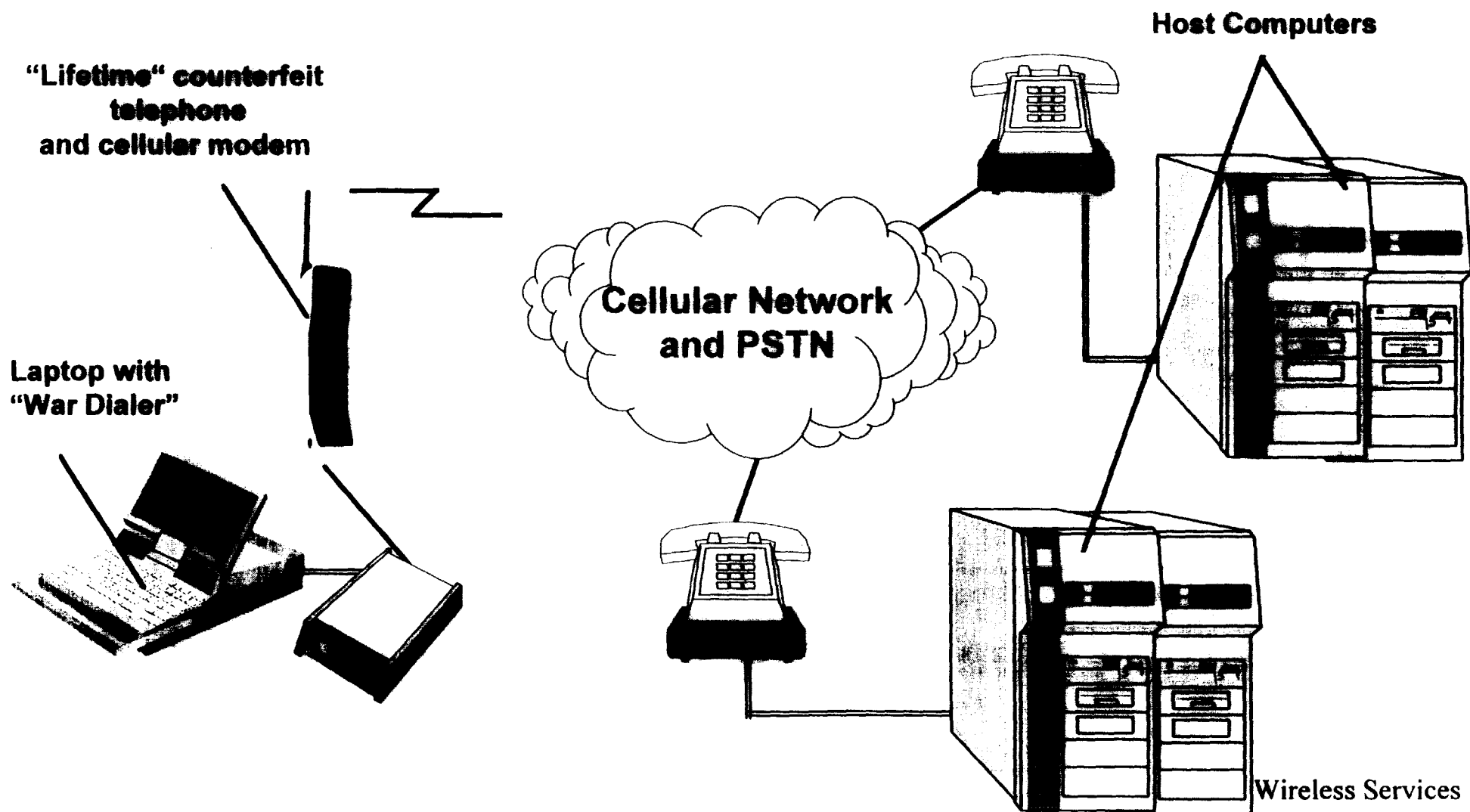
Cloning – Nationwide and Dynamic

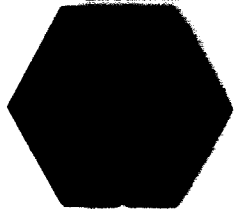


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Convergence of Hacking and Phreaking

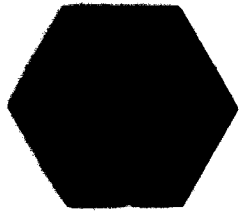




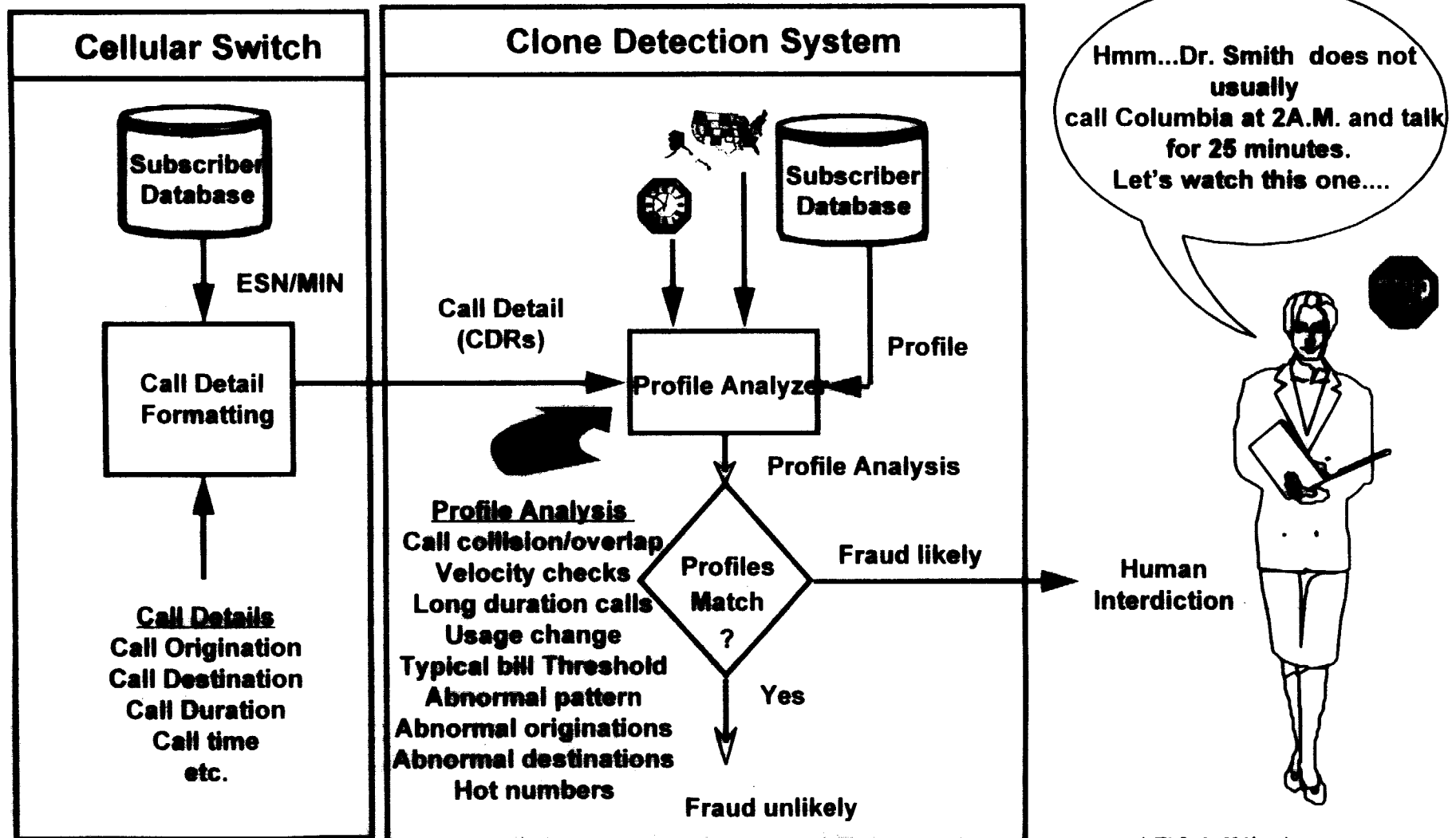
Cellular Fraud: History, Status, Technology, and Prevention

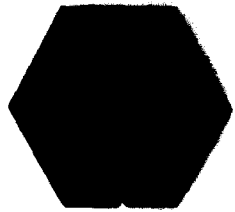
Emerging Technologies for Fraud Management

- ◆ **Time-based validation systems**
- ◆ **Radio frequency (RF) signature technology**
- ◆ **Voice verification technology**
- ◆ **Dynamic password technology**
- ◆ **Cryptographic authentication techniques**



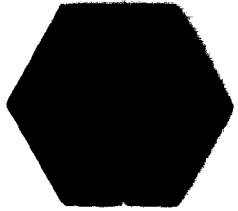
Principle of Profiling System





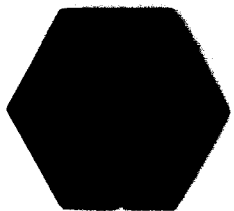
Existing Technologies for Fraud Management

- ◆ **Pre-call validation of every call**
- ◆ **Post-call validation of every call**
- ◆ **Expert system-based call detail analysis systems (CloneDetector)**
- ◆ **Personal Identification Number (PIN) identification techniques – “Fraud Prevention Features”**

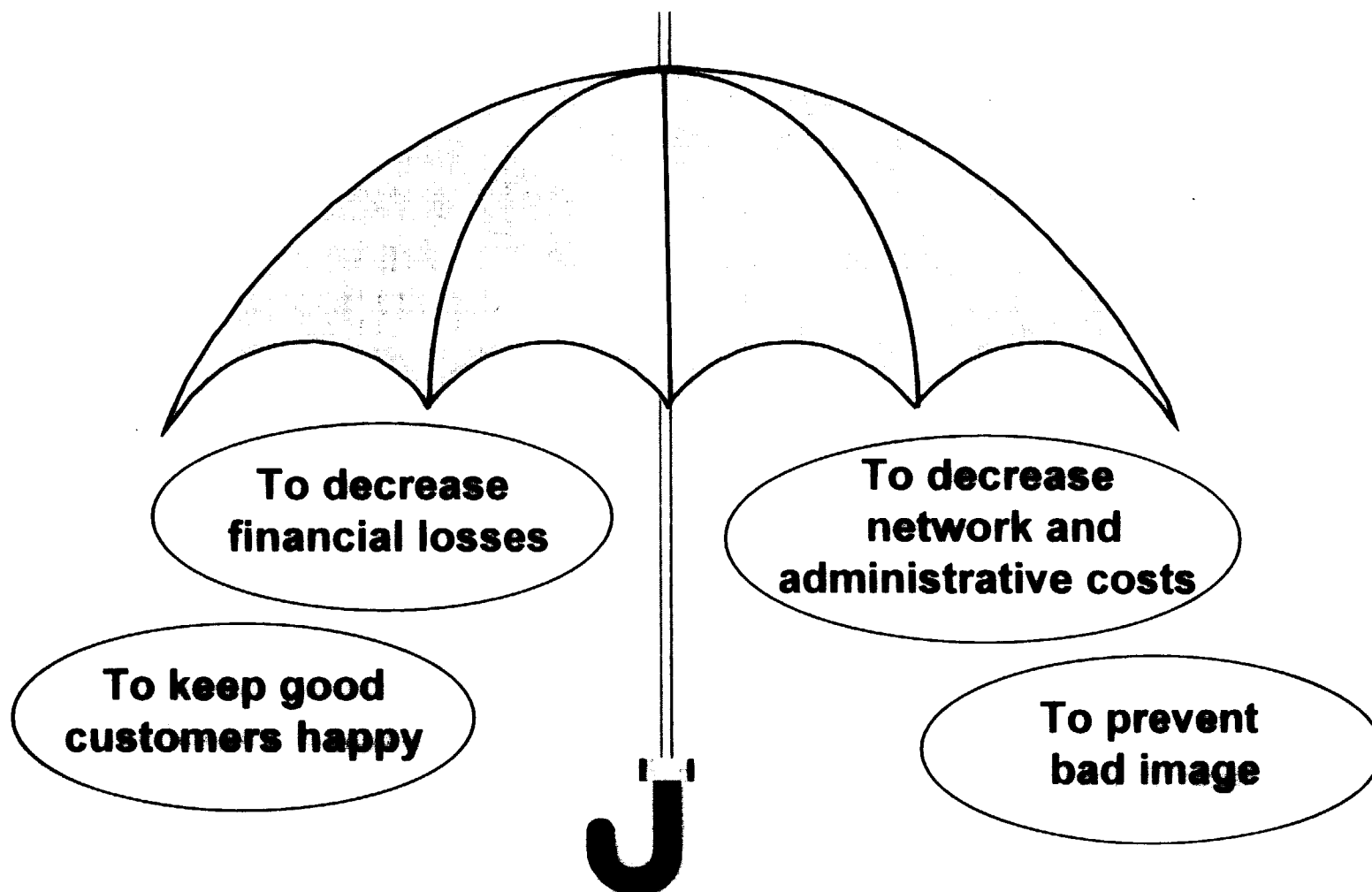


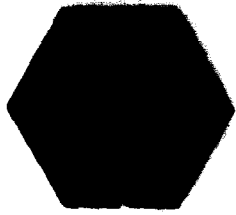
Fraud Products and Services

- ◆ **Profiling “CloneDetector” System**
- ◆ **FraudManager Service**
- ◆ **HLR Visibility**
- ◆ **Stolen Phone StatCheck Service**
- ◆ **Customer Positive File Service**
- ◆ **Positive Validation Service (PVS)**



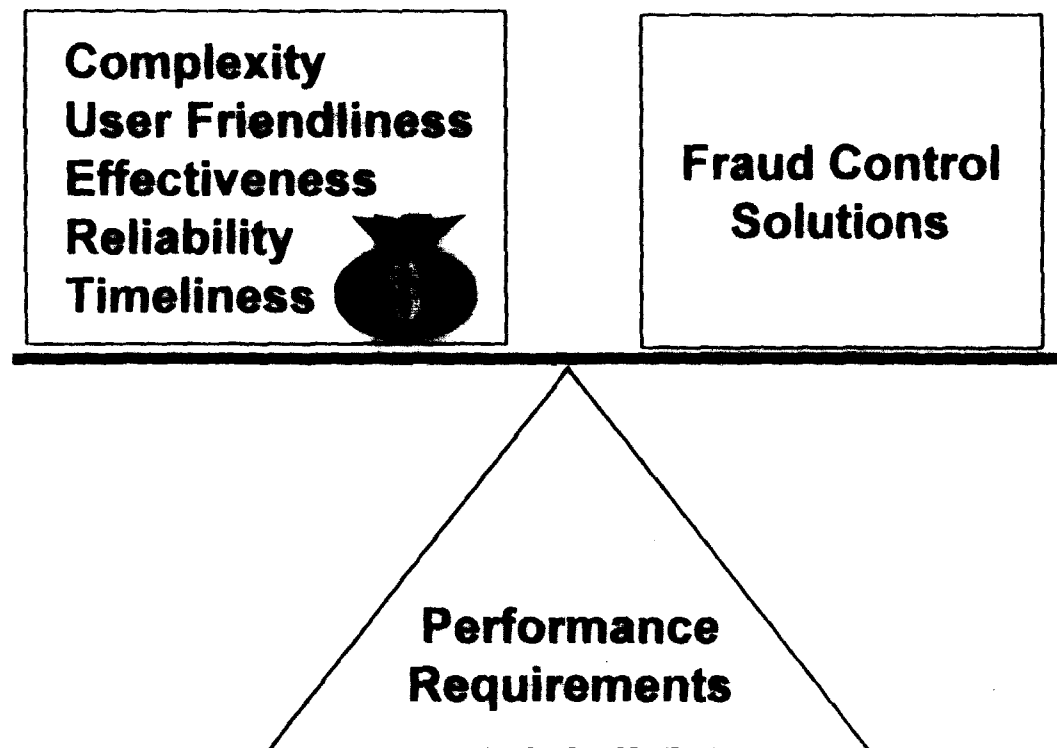
Why Reduce and Manage Fraud?

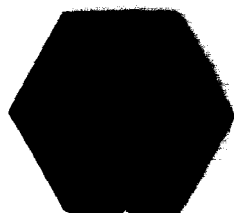




Cellular Fraud: History, Status, Technology, and Prevention

Balancing Fraud and Business Operations





Top 18 International Cellular Markets

- | | |
|------------------------------|----------------------|
| ◆ United States – 33 Million | ◆ France – 770,000 |
| ◆ Japan – 3,192,000 | ◆ Mexico – 123,000 |
| ◆ UK – 2,733,000 | ◆ S. Korea – 677,200 |
| ◆ Germany – 2,280,000 | ◆ Thailand – 703,000 |
| ◆ Italy – 1,841,000 | ◆ Brazil – 598,000 |
| ◆ Canada – 1,600,000 | ◆ Finland – 595,000 |
| ◆ Australia – 1,443,900 | ◆ Taiwan – 570,000 |
| ◆ China – 1,212,400 | ◆ Mexico – 540,800 |
| ◆ Sweden – 1,096,000 | ◆ Malaysia – 540,000 |